

# Agenda

## Tuesday, October 10, 2006

8:30 AM	Chair's opening remarks, findings from last meeting, plan for this meeting	Joe Mazur
8:45 AM	Heliophysics Update	Dick Fisher
9:45 AM	MOWG presentations to HPS	Joe Mazur, Spiro Antiochos
10:00 AM	Break	
10:20 AM	LWS program status, discussion & questions	Chris St. Cyr/Lika Guhathakurta
11:00 AM	RBSP & MoO Status	Barbara Giles
11:40 AM	SDO status	Dean Pesnell
12:00 PM	Lunch	
12:30 PM	Lunch Talk : Radiation Risk Management on Human Missions to the Moon and Mars	Ron Turner
2:00 PM	Exploration and LAT update	Gordon Johnston
2:40 PM	LWS role in ESMD	All
3:15 PM	Break	
3:35 PM	Solar Sentinels/Solar Orbiter	Adam Szabo/Lika Guhathakurta
4:00 PM	IT probes science update & discussion	Tony Manucci
5:00 PM	Group discussion and writing assignments	All
5:30 PM	End of day 1 Group Dinner	

## Wednesday, October 11, 2006

8:30 AM	Chair's remarks – highlights from first day	Joe Mazur
8:45 AM	Discussion of draft findings	All
9:05 AM	TR&T update	Mona Kessel
9:30 AM	NPOESS space environment monitors	TBD
10:15 AM	Break	
10:25 AM	National Space Weather Council recommendations	Lika Guhathakurta
10:35 AM	Solar Probe Risk Mitigation - status	Haydee Maldonado
10:50 AM	Discussion; plans for the next MOWG meeting	All
12:00 PM	End of meeting	

# **LWS MOWG Meeting**

## **10-11 October 2006**

**Joe Mazur**

**The Aerospace Corporation**

**Space Sciences Department/Chantilly**

**[joseph.mazur@aero.org](mailto:joseph.mazur@aero.org)**

**703-324-8915**

# Topics

- **Approach & last findings**
- **Topics from our September telecon**
- **Agenda for this meeting**
- **Events of significance since our last meeting in May 2006**
- **LWS MOWG presentations to the HPS**

## Approach

- **Input from presentations**
  - **Topics brought up at the pre-meeting telecon**
  - **Topics of opportunity**
- **Discussion & follow-up questions, all with an LWS focus**
- **Generate findings**
  - **Context of the issue**
  - **Statement of the issue**
  - **“We find...”**

## **LWS MOWG Finding on the LWS Budget**

The proposed FY07 budget and multi-year run out contain a ~ 5% cut in the Living With a Star Program. The LWS MOWG recognizes that this cut occurs in the context of severe budgetary constraints agency wide. In adjusting the LWS program plan to account for this decrease in resources, the HQ program managers have determined that the shortfall will be accommodated by slipping future missions, while maintaining the LWS Science program of research grants and TR&T. Although the slippage of missions will delay the eventual future societal and agency benefits from the LWS program, the MOWG believes that the strategy of protecting the grants program is the best compromise, and we commend the HQ management for taking this route. The reasons for this include the following:

- Cutting the grants program would immediately reduce the LWS scientific workforce, and would immediately diminish returns from the program.
- With the launch of Solar-B, SDO, and related (non LWS) missions such as STEREO, TWINS, THEMIS and CINDI, the stream of new data and observations coming in the next few years will be unprecedented, and will require the full scientific workforce to properly analyze the data; decreasing this workforce would be precisely the wrong move at this time
- The LWS science program, in addition to helping with the interpretation of new data, is addressing theoretical problems of central importance to realizing the goals of LWS to develop the understanding and eventual prediction/mitigation of Space Weather events affecting systems on Earth and in space.

**LWS MOWG  
Finding  
on  
Solar Probe Mission Risk Reduction**

Solar Probe will be a historic mission, flying into one of the last unexplored regions of the solar system, the Sun's atmosphere or corona, for the first time. In 2005, the Solar Probe Science and Technology Definition Team (STDT), together with APL, GSFC, and JPL, completed a rigorous scientific and technical engineering study (STDT Report NASA/TM-2005-212786) for a new Solar Probe mission architecture, fully instrumented with in-situ and appropriate remote sensing observations. This combined STDT also performed a broad range of technical trades and risk mitigation activities to reduce overall mission risk, as well as identify the lowest cost approach to carrying out this exciting mission.

The LWS MOWG recognizes and is encouraged by the significant progress that has been made by the STDT, and recommends and supports NASA in its effort to secure the resources (from NASA sources such as SMD ESTO) necessary to continue these technical and risk mitigation activities that are required to undertake this exciting, breakthrough mission.

## Topics from 6 September 2006 Telecon (1/2)

Topic	Notes
LWS role in Exploration Mission Systems Directorate	<ul style="list-style-type: none"> <li>• ESMD typically doesn't have requirements that relate to LWS science (Lika)</li> <li>• ESMD looks at one mission at a time</li> <li>• Logically an LWS mission like Sentinels is relevant</li> <li>• Any lessons from NOAA &amp; its experience with customers that can be applied to the relationship between LWS &amp; ESMD?</li> <li>• Discussion for meeting: is there a proactive role for LWS in ESMD that makes sense?</li> <li>• Invite Mike Wargo to discuss his view of a bridge between LWS and ESMD</li> </ul>
Lunar Architecture Report/HPS subpanel on heliophysics science and the moon	<ul style="list-style-type: none"> <li>• What are the highlights &amp; prioritized science to date of the HPS lunar subpanel? (Jim Spann/Harlan Spence)</li> <li>• What is the status of the concept studies for lunar sortie science opportunities? (Lika)</li> </ul>
IT probes science update	<ul style="list-style-type: none"> <li>• Recent CEDAR workshop results</li> <li>• Status</li> </ul>

## Topics from 6 September 2006 Telecon (2/2)

NPOESS	<ul style="list-style-type: none"> <li>• Impact on LWS science of loss of space environment suite &amp; apparent lack of community discussion (see AGU SPA newsletter Vol. XIII, issue 72 that came out just after our telecon)</li> <li>• What are the contingency plans for space envi monitors on NPOESS?</li> <li>• Bigger question of the importance of existing programs and databases to the goals of LWS; are there programs from other agencies that have fallen off the table?</li> </ul>
Missions	SDO status
	RB & IT update
Sentinels	Solar Orbiter status & relationships to Sentinels
TR&T	Overall status and impact of focused science areas
National Space Weather	Council recommendations have recently been published



# Agenda

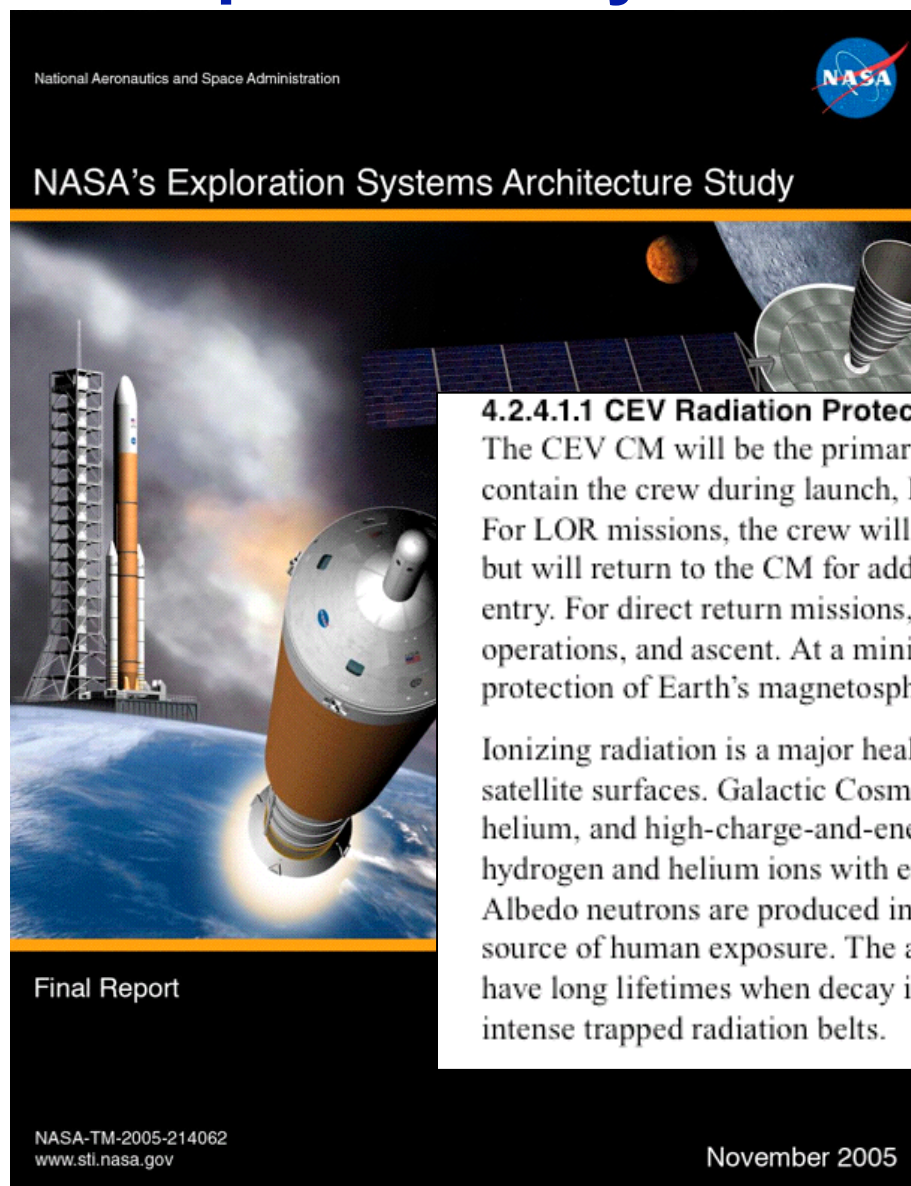
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# Exploration Systems Architecture (11/05)



## 4.2.4.1.1 CEV Radiation Protection

The CEV CM will be the primary crew cabin for the majority of the lunar mission. It will contain the crew during launch, Earth-orbital operations, trans-lunar cruise, and in lunar orbit. For LOR missions, the crew will transfer to the LSAM for the duration of surface operations, but will return to the CM for additional lunar orbit operations, trans-Earth coast, and Earth entry. For direct return missions, the crew will remain in the CM for lunar descent, surface operations, and ascent. At a minimum, the crew will spend 9 days in the CM beyond the protection of Earth's magnetosphere in the interplanetary radiation environment.

Ionizing radiation is a major health hazard everywhere in space and on all planetary and satellite surfaces. Galactic Cosmic Rays (GCRs) permeate the galaxy and consist of protons, helium, and high-charge-and-energy ions. Solar Particle Events (SPEs) are dominated by hydrogen and helium ions with energies of several hundred millions of electron volts (MeVs). Albedo neutrons are produced in planetary atmospheres and surfaces and can be a significant source of human exposure. The albedo neutron decay produces electrons and protons that can have long lifetimes when decay is within planetary magnetic trapping regions, giving rise to intense trapped radiation belts.

# HPS Meeting: 13-15 September 2006

Excerpts from the Heliophysics Subcommittee report:

- *“The published Heliophysics Roadmap provides an excellent plan for understanding and monitoring the lunar environment. The HP Lunar Science Sub-panel has updated the science spread sheet...”*
- *“The HPS shares these concerns (about cuts in R&A) because the R&A budget is a core element of the HP research enterprise.”*
- *“It is essential that lower cost options for Explorer class launches be developed rapidly.”*
- *“As mission costs increase the rate of flights will decrease causing the overlap of missions required for a systems approach to understanding the Heliosphere to fade away.”*

# Group Dinner 6:30pm



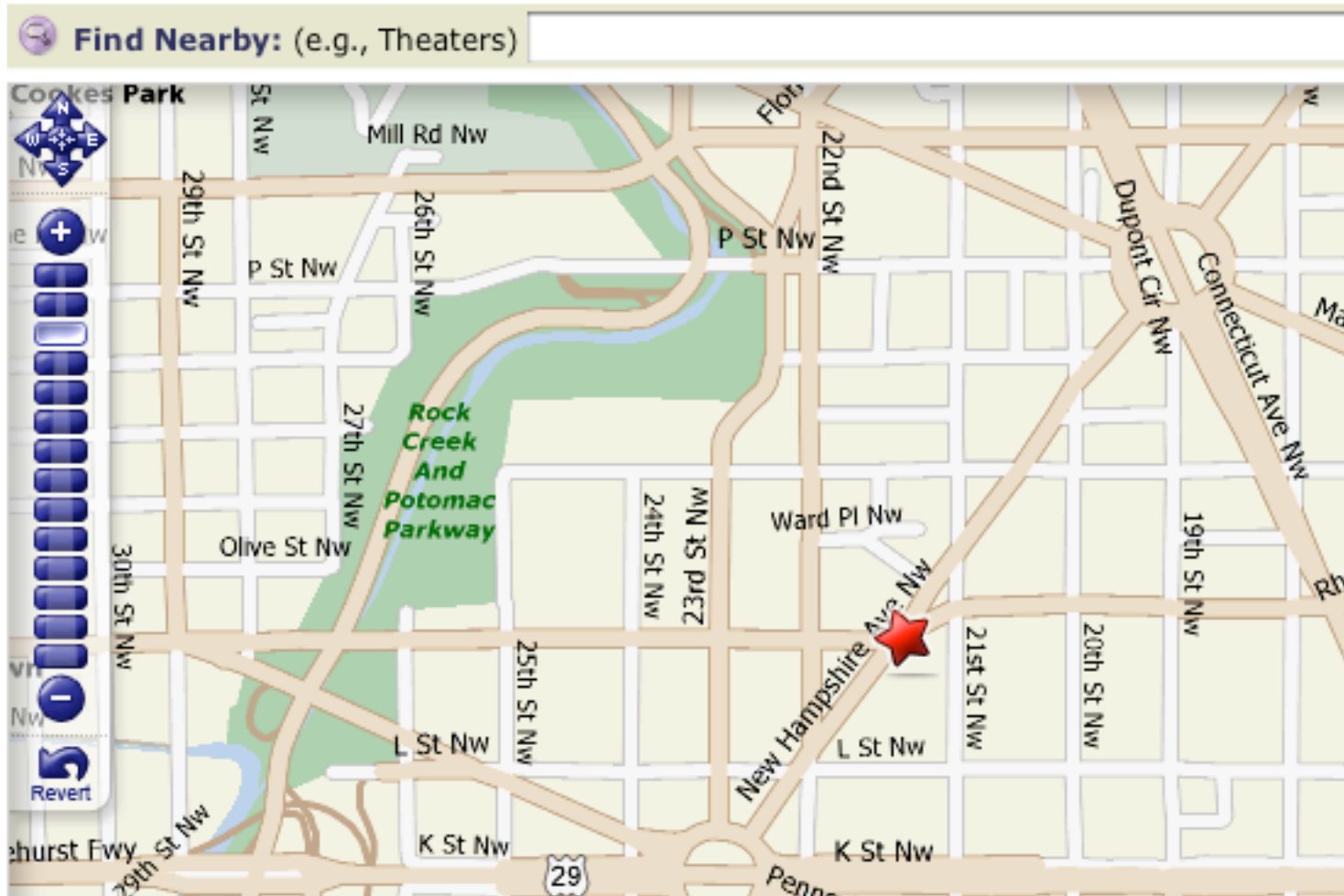
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# Backups



# Significant Events: ES Architecture (11/05)

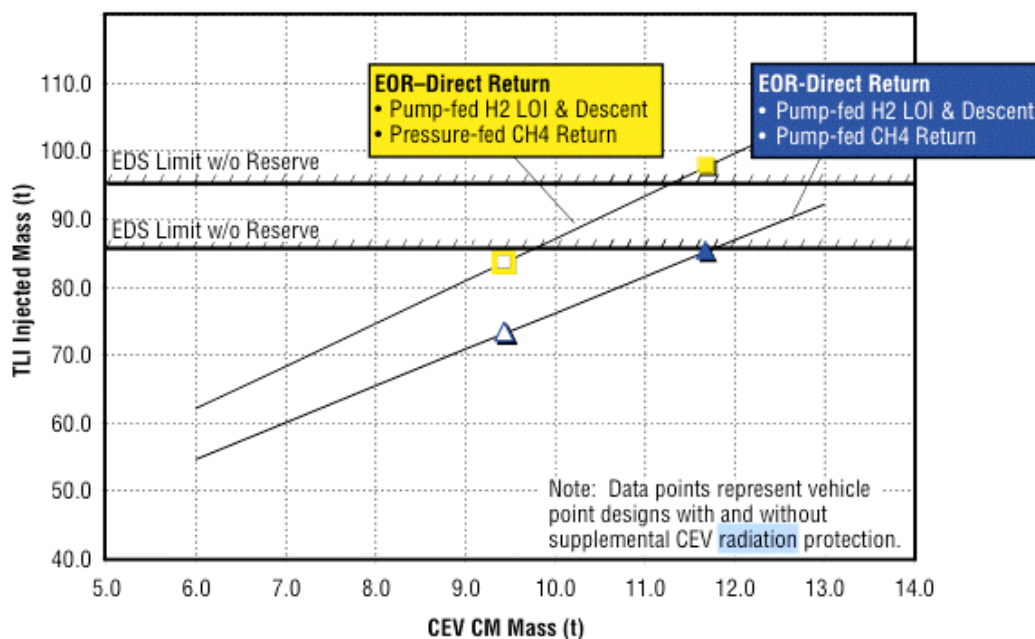


Figure 4-10. TLI Injected Mass versus Crew Compartment Mass, With and Without 5.0 g/cm<sup>2</sup> Supplemental Radiation Protection

## Cycle 2 Radiation Analysis Impact on CEV and Mission Design

The ESAS team reviewed the radiation analysis with an eye toward reducing the supplemental radiation shielding that was resulting in a diminishing benefit to the crew. **Figure 4-10** illustrates the effect of supplemental radiation shielding on injected spacecraft mass. Since the radiation shielding mass is carried round-trip, its mass has one of the greatest mass sensitivity penalties, which identifies it as a candidate for additional analysis. (Refer to **Table 4-4** for more information.) ESAS engineers and safety and risk analysts agreed to proceed into a third analysis cycle utilizing a maximum of 2.0 g/cm<sup>2</sup> of supplemental radiation shielding—the range in which the dose analysis indicated that shielding had the greatest effect. The dose and biological risk data was derived from a 4-times-1972 event that represented a 99.5 percent confidence of not exceeding a fluence level exceeding 30 MeV for a mission duration of 1 year. Therefore, for a 16-day maximum mission (0.04 year duration), the probability for exceeding a 0.01 percent probability of acute death, a 1.9 percent probability of debilitating sickness, and a 3.4 percent probability of excess cancer risk is itself only 0.005. For 5 g/cm<sup>2</sup> of shielding, these values are either zero or approaching zero.

# **LWS TR&T Steering Committee Report 4/30/06**

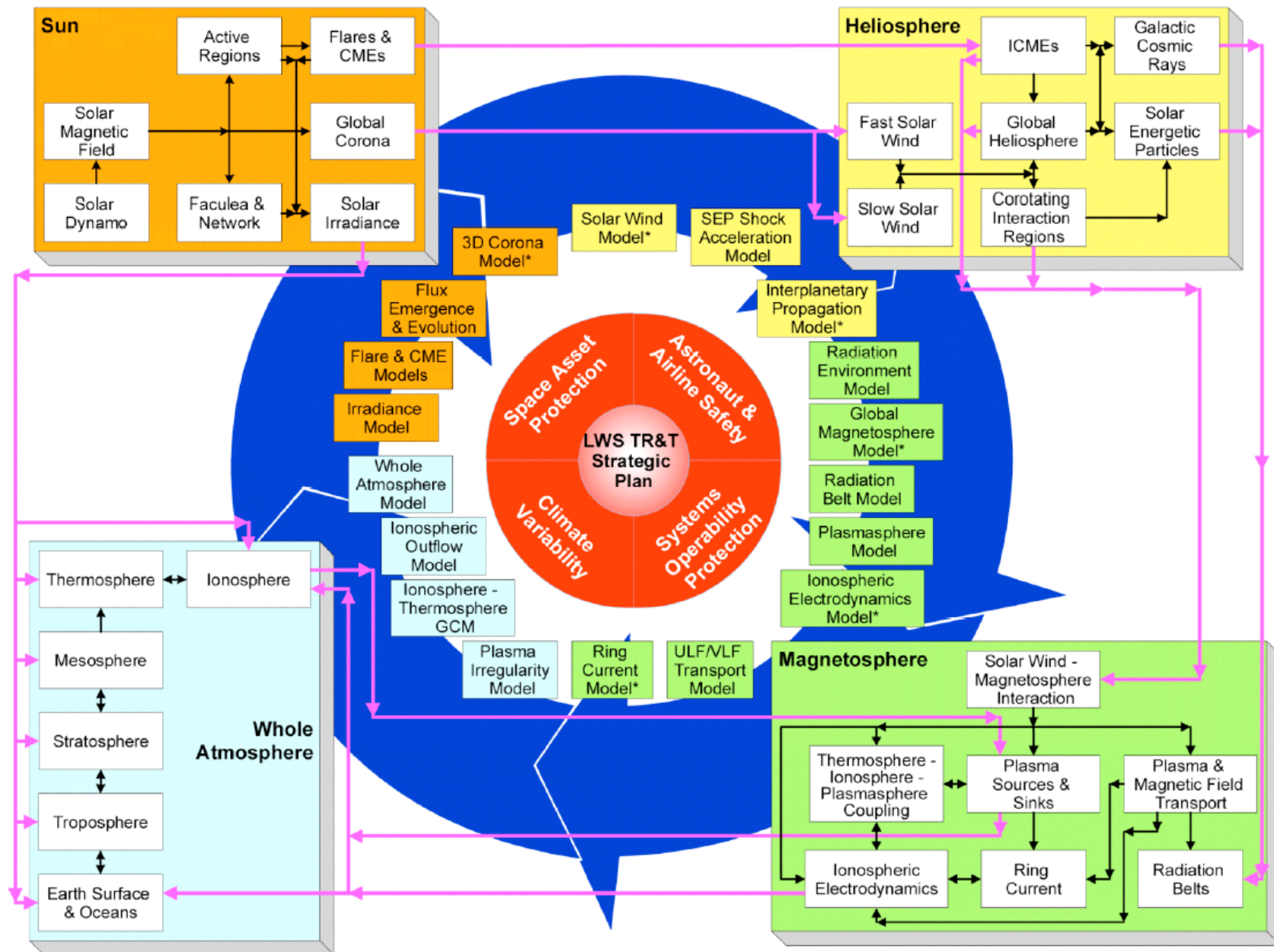
## **[http://lws-trt.gsfc.nasa.gov/trtSC\\_report\\_2006\\_final.pdf](http://lws-trt.gsfc.nasa.gov/trtSC_report_2006_final.pdf)**

The report is a useful reference for how the LWS program remains focused on life & society effects, yet is simultaneously able to adjust its priorities to support new missions such as VSE

Recommended strategic goals for the next decade (paraphrased from full report):

- In support of NASA's Vision for Space Exploration objectives, the TR&T needs to deliver the understanding and modeling required for useful prediction of Solar Energetic Particle events and Galactic Cosmic Ray variability at the Earth, Moon, Mars and throughout the solar system
- The TR&T needs to deliver the understanding of how variations in solar radiation and particles contribute to global and regional climate change
- The TR&T needs to deliver the understanding and modeling required for effective forecasting/specification of inner magnetospheric radiation and plasma
- The upper atmosphere and ionosphere is central to a host of space weather effects, ranging from anomalous satellite drag, GPS position error, radio blackouts, radar clutter and geomagnetically induced currents. In order to mitigate space weather's impact on life and society NASA's LWS/TR&T in conjunction with other national agencies such as NSF and DoD needs to deliver understanding and predictive models of upper atmospheric and ionospheric coupling above and below

# LWS TR&T Steering Committee Report 4/30/06





LWS MOWG  
presentations  
and findings  
from the past 3  
years are  
easily  
accessible

**LWS MOWG (MANAGEMENT OPERATIONS WORKING GROUP)**

LWS Management Operations Working Group (MOWG), [Membership List](#), April 2006

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[LWS Management Operations Working Group \(MOWG\) Report](#), May 1-2, 2006

[LWS Management Operations Working Group \(MOWG\) Report](#), August 9-11, 2005

[LWS Management Operations Working Group \(MOWG\) Report](#), February 23-24, 2005

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LWS Management Operations Working Group (MOWG), May 2006

- [Agenda](#) (35 KB)
- [Chair's Opening Remarks](#) (4 MB)
- [The Role of MOWG in Advisory Committees](#) (5 MB)
- [LWS - A Systems Approach to Sun-Earth Science](#) (1 MB)
- [LWS - Space Environment Testbeds Update](#) (7 MB)
- [The Living With a Star Sentinels Mission](#) (17 MB)
- [Solar Probe Risk Mitigation Study Plan and Current Status](#) (6 MB)
- [SDO Update](#) (12 MB)
- [LWS - Proposed Workshop](#) (116 KB)

LWS Management Operations Working Group (MOWG), May 2004

- [MOWG Findings](#) (85 KB)
- [MOWG Membership](#) (70 KB)
- [Agenda](#) (72 KB)
- [AFRL Proposed Radiation Science Mission](#) (538 KB)
- [Sentinels](#) (1.3 MB)
- [ILWS European Partnership](#) (163 KB)
- [JPL MOWG Presentation](#) (169 KB)
- [LWS Exploration Initiative](#) (164 KB)
- [Picard](#) (1.1 MB)
- [An Evaluation of Continued SAMPEX Data Collection to the Goals of the LWS Geospace Program](#) (1.8 MB)
- [GMDT SWARM letter](#) (86 KB)
- [LWS MOWG Report to SECAS](#) (122 KB)
- [LWS Program Report to LWS MOWG](#) (1.9 MB)

LWS Management Operations Working Group (MOWG), October 2003

- [MOWG Findings](#) (66 KB)

LWS Management Operations Working Group (MOWG), June 2003

- [MOWG Findings](#) (54 KB)
- [Agenda](#) (4 KB)
- [MOWG Panel Members](#) (7KB)
- [ISEC Status Update.pdf](#) (947 KB) - Dick Fisher
- [Program Overview of LWS](#) (1.22 MB) - Chris St. Cyr
- [Program Overview of LWS](#) (cont) (1.03 MB) - Larry Zanetti
- [TR&T Program](#) (16 KB) - Dave Sibeck
- ["DRAFT" TR&T SDT Final Report](#) (99 KB) - Jack Gosling
- [Geospace Status & Direction](#) (1.5 MB) - Barbara Giles / Barry Mauk
- [SET Status](#) (1.31 MB) - Dana Brewer
- [The Community Coordinated Modeling Center \(CCMC\)](#) (1.83 MB) - Michael Hesse
- (524 KB) [Data and Modeling Services](#) - Chuck Holmes
- [Sentinels](#) (1.01 MB) - Adam Szabo